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ABSTRACT

This curriculum unit was prepared for senior high classroom use to teach geography, history, and environmental issues. The objective of the lesson is to illustrate the historical man/river relationship between Egypt and the Nile River, and the impact of the Aswan dam on the agricultural and economic needs of the country today. The lesson requires three or four classroom periods, and includes maps, charts, vocabulary list, and discussion topics. (NL)

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THE ASWAN HIGH DAM- A LESSON ON MAN'S ENVIRONMENTAL IMPACT

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THE ASWAN HIGH DAM- A LESSON ON MAN'S ENVIRONMENTAL IMPACT

I. Introduction:
Herodotus, the Greek historian, wrote in 450 BC that "Egypt is the gift of the Nile". That statement is still true today, but the construction of the Aswan High Dam in the 1960's has damaged the relationship that Herodotus suggested. The objective of this teaching strategy is:
1. to show students the man/river relationship that existed in historical times
2. and that development of the Aswan High Dam has or will seriously threaten Egypt's ability to meet the agricultural and economic needs of its people. Students need to know that any changes that man introduces to the earth's environment may have long reaching and unforeseen consequences.

II. Geographical Concepts:
1. The significance of locations changes as cultures change their interactions with the environment.
2. The knowledge of locations and their characteristics is a key factor in understanding human interdependence.
3. Describe and interpret complex physical processes that produce the biological and natural features of places.
4. Explain how intensive human activities can have positive and negative consequences on places.
5. Give examples of how people evaluate and use natural environments to extract crops and create settlements.

III. Audience:
Senior high geography, environment, or history classes

IV. Task Analysis:
A. Identify the Nile System
1. Geographic vocabulary:floodplain, silt, Ethiopian highlands, Sudan, Egypt, White Nile, Blue Nile, Rosetta mouth, Damietta mouth, Cairo, Khartoum, cataracts.
2. Discussion: The Nile is the longest river in the world, its most distant source lying in the hills east of Lake Victoria in Central Africa some six thousand kilometers away from its Mediterranean mouth. This, the White Nile branch, originates in a tropical climate and consequently contributes great quantities of water. The other major branch, the Blue Nile, originates in the highlands of Ethiopia. Heavy spring rains result in extensive run-off of water and soil which drain into the tributaries of the Blue Nile and meet the White Nile at Khartoum in the Sudan. The speed of the current increases as the Nile descends over a series of cataracts south of Aswan. The prime agricultural lands are located in middle Egypt where the Nile floodplain averages 15-20 kilometers in width. The Nile continues north and splits into two branches on the delta. The apex of the delta is the easiest of the delta ford locations, was a historical crossroads, and is the site of the modern day city of Cairo. The Rosetta and Damietta branches of the Nile flow through the delta for another 150-200 kilometers before reaching the Mediterranean sea.
3. Delivery Strategy: Students can use an atlas to identify place locations and the mathematical grid system to locate absolute locations.
4. Materials necessary: atlas, overhead projector, and transparency "The Nile River Basin"

B. Identify the effect of the spring floods on Egyptian agricultural production before the construction of the Aswan High Dam

1. Geographical vocabulary: dikes, sluice, canal, irrigation, delta, inundated, alluvium.

2. Discussion: Over the millenia the Nile floods laid down thick deposits of alluvium. These deposits became rich alluvial soil- so rich so that most food crops would grow on it- provided that sufficient quantities of water would be available for irrigation during the dry part of the year. The flood inundated the flood plain near the bank and delivered water to the edges of fields that lay distant from the river's channel. In addition, the flood deposited a light covering of new soil every year. This soil was rich in potassium and micronutrients that fertilized and enriched the growing of crops. The annual deposit of alluvium created a "natural" dike that caused the river to be higher than the surrounding floodplain. As the river rose in the summer, the Egyptian water engineers cut sluices in the dike that allowed the river to flow out to surrounding fields and enabled the engineer to control the volume of water that went to each field. Fields in the flood plain that were inundated by the flood were not accessible for a period of up to three months because of high water levels in the valley. As the flood receded, those fields were too wet to work for another period of time and therefore could only support one crop per year. Fields located near, but not on, the flood plain had access to water all year round and could support two crops per year. Over the millenium Egyptian rulers took great care to maintain the dikes, sluices, and clear the channels whenever necessary. The agricultural surplus made Egypt a land of abundant harvest and from antiquity till the middle ages she remained the richest and most productive agricultural land in the world.

3. Delivery Strategy: Lecture on historical Egypt's use of the Nile to extract crops and create settlements

4. Materials Needed: Overhead projector and transparencies "Nile Valley-Cross Section" and "Ancient Egyptian Irrigation Systems"

C. Identify the environmental effects of the Aswan High Dam

1. Geographical vocabulary: foreign aid, reservoir, hydroelectric, alluvium, shoreline erosion, salinity, nitrates, groundwater, sedimentation, Richter scale

2. Discussion:

The Aswan High Dam was completed in 1970. The dam was built by the Egyptians with engineering and foreign aid from the Soviet Union. The objectives of the dam were to control the annual flooding, store water for regulated irrigation, and generate hydroelectric power. The High Dam did meet those objectives, but also created the following environmental and economic problems:

a. Erosion of the riverbed and delta- Before the construction of the High Dam, 88 % of the spring flood alluvium was deposited on the delta of the Nile. Since the spring runoff from the Ethiopian highlands no longer travels the course of the river, the alluvium is deposited behind the dam. The delta is not replenished, so storms of the Mediterranean have caused shoreline erosion that have destroyed resort towns at the mouth of the Rosetta Nile.

b. Destruction of the fishing industry- Nile alluvim carried with it vast quantities of micronutrients that attracted schools of sardines. Pre-construction catches were as high as 1800 tons per year. Since the construction, the catch has decreased to a low of 300 tons per year. The sardines no longer school offshore and have left the area for other parts of the Mediterranean.

c. Increased soil salinity- All water contains trace amounts of salts and minerals. As water evaporates, these minerals are left in the soil. Since the construction of the High Dam, fields are irrigated throughout the year. Increased soil salinity is a negative result. By 1972 one third of the arable land was more or less salinized and by 1982 almost all irrigated land was salt affected.
d. Decreased potassium and micronutrient deposition- The alluvium carried concentrations of potassium and micronutrients from upstream. These materials are no longer available to the farmers below the dam and they have recently been forced to buy chemical fertilizers to replenish their soils. It has been estimated that 10% of Egyptian agricultural production is lost every year due to deterioration of soil fertility. Commercial chemical runoff has caused downstream water quality concerns.
e. Increase of groundwater levels- The constant and stable flow of the Nile has resulted in increased groundwater levels. As the groundwater rises, it dissolves salts from soil and bedrock. Man made structures act like sponges that suck in the salts and thereby weaken foundations. The result is a concern for the stability of the foundations of the Pyramids at Giza and the large buildings in Cairo and other downstream cities.
f. Desertification- Desert winds blow sands and dust from the Sahara into the Nile basin. Pre-dam floods covered the entire width of the valley. Alluvium was estimated at 110 million tons resulting in an annual deposit of 1 mm of sediment across the width and length of the entire valley. This phenomenon dilluted the adverse effects of the blowing desert sands. To date losses due to the encroachement of the desert ammount to 8 % of the total agricultural area and are increasing year by year.
g. Earthquakes- The enormous weight of Lake Nasser's water has caused earthquakes in the region around the High Dam. Quakes as high as 5.3 on the Richter scale have occurred since the building of the dam.
h. Climate shifts- The Lake Nasser reservoir and greatly increased evaporation in the area south of the dam has influenced the climate of southern Egypt and northern Sudan.
The ramifications of this phenomenon are yet to be fully understood.

3. Delivery Strategy: 1. Student groups should identify (brainstorm) potential benefits and risks in the contruction of a "high dam" on a major waterway. 2. Teacher uses overhead transparency and lecture to identify the benefits and environmental costs of such a project on the Nile.
3. Teacher-led discussion should focus students on potential ways to decrease or eliminate the negative environmental effects of the High Dam.4. Teacher-led discussion should focus on the wisdom of future dam projects and seek alternative means of energy or food production

4. Materials needed: Lecture data, overhead projector, and transparency "Environmental Effects of the Aswan High Dam"

V. Strategy effectiveness:
The strategy of this project is effective with students because it uses historical fact to examine how man used the natural force of the river to support agricultural needs, uses current events to show how man's disruption of the natural forces can lead to unforeseen ecological problems, and focuses student's attention on the environment.

VI. Suggested classroom time:
Three or four class periods

VII.Bibliography:

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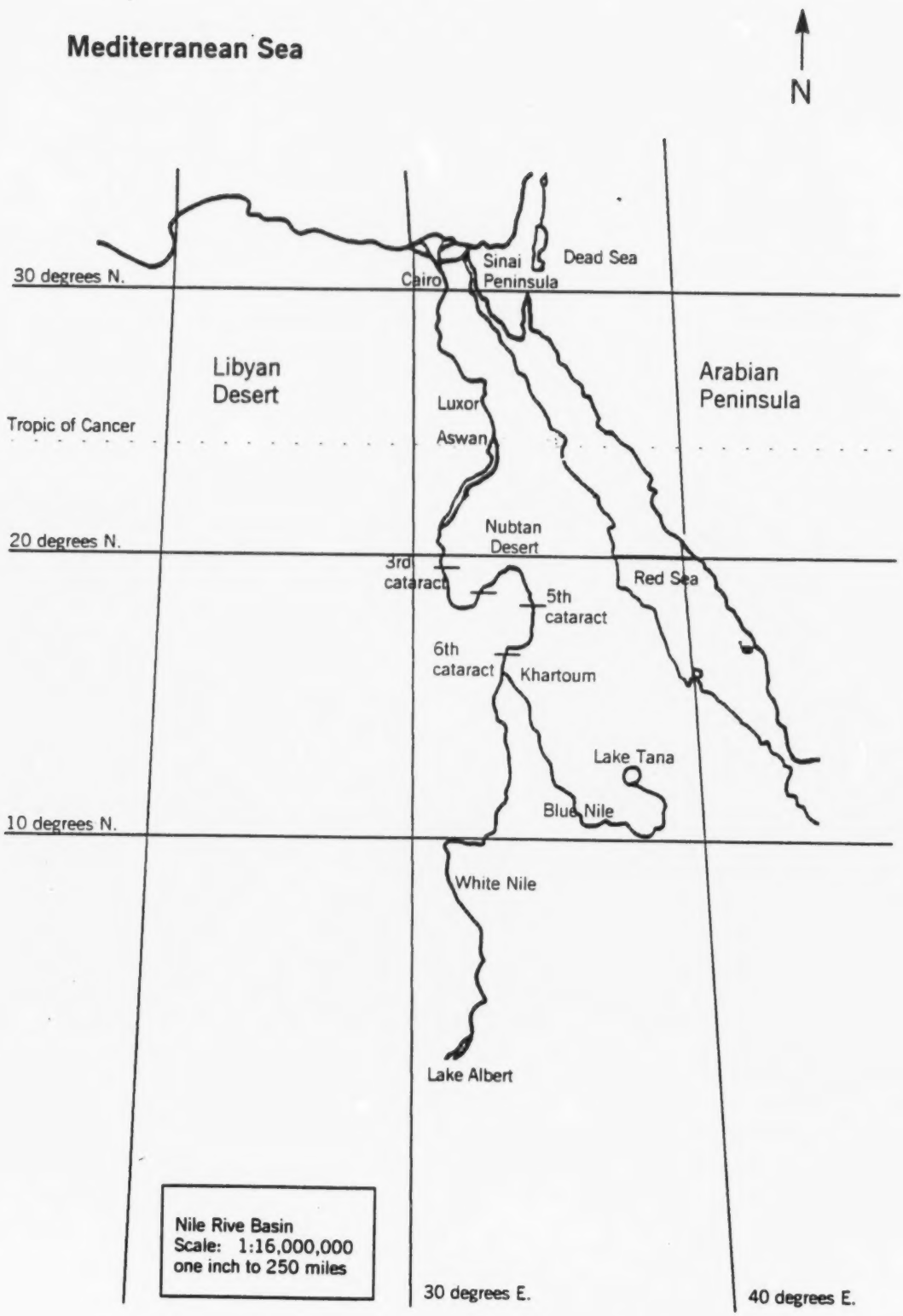
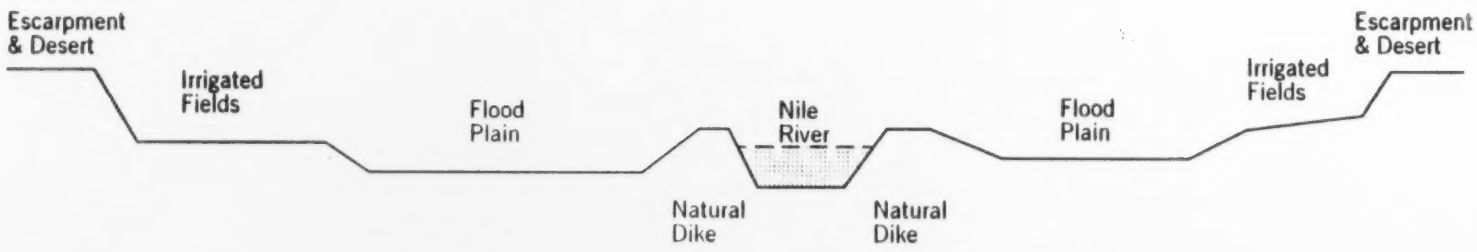
Environmental Effects of the Aswan High Dam

- Erosion of riverbed and delta
- Destruction of fishing industry
- increased soil salinity
- Decreased potassium deposition
- increased ground water levels
- Desertification
- Earthquakes
- Potential climate shift


Mediterranean Sea
N
30 degrees N.
Cairo
Sinai Peninsula
Dead Sea
Libyan Desert
Arabian Peninsula
Luxor
Tropic of Cancer
Aswan
20 degrees N.
Nubtan Desert
3rd cataract
Red Sea
5th cataract
6th cataract
Khartoum
Lake Tana
Blue Nile
10 degrees N.
White Nile
Lake Albert
Nile Rive Basin
Scale: 1:16,000,000
one inch to 250 miles
30 degrees E.
40 degrees E.

Nile Valley – Cross Section

Pre–dam irrigation scheme



Ancient Egyptian Irrigation Systems

The Shaduf (oldest), the Sakkia water wheel, and Archimedes screw